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Designing an Internet of Things Based Automatic Clothesline

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Abstract. In Indonesia, there are 2 seasons, rainy season and dry season. The rainy season occurs from November to March, while the dry season occurs from April to October. With the changing seasons that are very unpredictable, so that the weather cannot be regulated by humans so that it requires the latest technology in this case the internet of things, that concern increases when outside the home and at that time there is no one at home. For fear of clothes that are dried wet with rain water as a result also if clothes that have been dried in the sun and will be exposed to rain water do not rule out the clothes we use will cause a bad odor. By using the NodeMCU ESP8266 dried is controlled by using a smartphone so that it can be controlled with a long distance then add a rain sensor to anticipate sudden rain fall. If a rain sensor is detected by water, the web system of the relay component will be active and give a command to NodeMCU esp8266, after the program runs the relay will be active and the motor can run forward or backward if the relay is on and the Relay is off then the motor unable to work forward or backward. Fabric weight is measured by a scale so that it can calculate the weight of the wet cloth obtained. The maximum number of fabrics to be used in this automatic clothesline is to keep the motor running and the motor won't be damaged easily.

1. Introduction

With seasonal changes that are very difficult to predict, so that sometimes the weather changes suddenly from hot to cold or vice versa so that the majority of people feel worried when drying clothes, these worries increase when outside the home and at that time there is no home person. For fear of clothes that are dried in the sun wet with rain as a result also if clothes that have been dried in the sun and will be exposed to rain do not rule out the clothes we use will cause a bad odor. To eliminate the worry that the clothes will not get wet with rain when we are outside the house and this can make us fresher when outside the home, then with the advancement of technology to produce new innovations that develop into better, we need an automatic control system by make an automatic clothesline system [1].

This tool will also help researcher laundry entrepreneurs in the process of drying clothes so that the fabric can be controlled automatically. The problems being solved include the clothesline control system, hardware architecture, including: electronic and mechanical devices. From the information above, the writer found a brilliant idea to realize an effective and efficient automatic clothesline. On the occasion of the preparation of the final project with the title design clothesline automatic clothesline with web-based.

2. Literature Review

2.1. NodeMCU

NodeMCU is an IoT platform that is open source. Consists of hardware in the form of system on chip ESP8266 from ESP8266 made by espressive system, also the firmware used, which uses the Lua scripting programming language. The term NodeMCU by default actually refers to the firmware used rather than the hardware development kit [2].

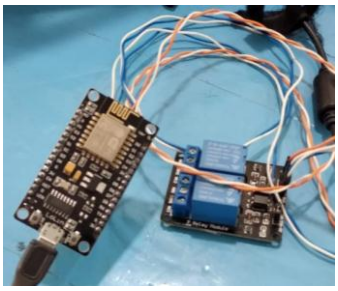

Figure 1. NodeMCU

2.2. IoT (Internet of Things)

IoT (Internet of Things) is a concept that aims to expand the benefits of continuously connected internet connectivity. Basically IoT (Internet of Things) refers to objects that can be uniquely identified as virtual rep-resentative in internet-based structures. How it Works IoT (Internet of Things) is an interaction between machines that are automatically connected without user intervention and at any distance. In order to achieve the workings of the IoT (Internet of Things) above the Inter-net is the liaison between the two machine interactions, while the user only serves as a regulator and supervisor of the working of the tool directly. The benefit of the IoT (Internet of Things) concept itself is that the work done can be faster, easier and more efficient [3].

2.3. Control system

The system is a collection of elements that interact to achieve a certain goal. This system describes a real event and unity. Real unity is a real object, such as places, things, and people that actually exist and occur. The system is a collection of elements that are interconnected with each other that form a unity in an effort to achieve a goal. The system is a network of interrelated procedures gathered together to carry out an activity or complete a certain target. Control can be interpreted as regulating, directing or governing, so the control system is an arrangement of physical components that are connected or related in such a way that they can govern, direct or regulate themselves or other systems [4].

2.4. Rainsensor

One of the sensors used in this study is the rain sensor which is a switching device that is driven based on rainfall (rain). Rain sensor used by the author in working with this tool uses a PCB plate (printed circuit board) that is formed in such a way that it resembles a comb.

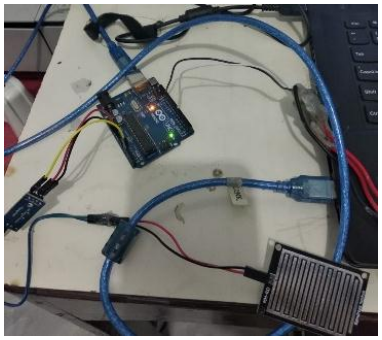

Figure 2. Rainsensor

In Figure 2.3 the rain sensor will be used to provide input to the microcontroller. After the microcontroller gets input, the microcontroller will give the output that will be received by the motor driver circuit which will instruct the motor to turn right or left [5].

Working Principle of Rain Sensor:

When there is raindrops falling and on the sensor panel there will be an el-electrolysis process by rainwater. And because rainwater is included in the class of electrolyte liquids where the liquid will conduct an electric current.

In this rain sensor there is a comparator ic where the output of this sensor can be in the form of logic high and low (on or off) and on this sensor module there are also outputs with voltage [6]. So it can be connected to the microcontroller pin. In short, this sensor can be used to monitor the presence or absence of rain where the output of this sensor is converted to some digital or analog output signals.

2.5. DC Motor

An additional tool that will be used by researchers is the DC power window motor that functions as a tool to assist in the design of making automatic clothesline equipment as shown in Figure 2.5.

Figure 3. DC Motor

Electric motors use electrical energy and magnetic energy to produce mechanical energy. Motor operation depends on the interaction of two magnetic fields. Simply stated that the electric motor works with the principle that two magnetic fields can be made to interact to produce motion. The purpose of the motor is to produce a force that moves (torque). The type of motor used in the power window system is a DC motor. One of the features of this DC motor is that its speed can be controlled easily. The nature of a DC motor if the mechanical power required is small enough then the DC motor used is also quite small [7].

2.6. *Relay Module*

A relay is an electrically operated switch that can be turned on or off, letting the current go through or not, and can be controlled with low voltages, like the 5V provided by the Arduino pins. Controlling a relay module with the Arduino is as simple as controlling any other output as we'll see later on. This relay module has two channels (those blue cubes). There are other models with one, four and eight channels. This module should be powered with 5V, which is appropriate to use with an Arduino. There are other relay modules that are powered using 3.3V, which is ideal for ESP32, ESP8266, and other microcontrollers [8], [10].

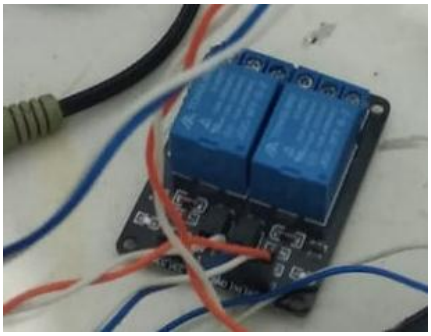

Figure 4. Relay module

2.7. Access Point

An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building. An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area. For example, if you want to enable Wi-Fi access in your company's reception area but don't have a router within range, you can install an access point near the front desk and run an Ethernet cable through the ceiling back to the server room [9].

Figure 5. Access Point

2.8. Direct Current Adaptors

A DC adaptor differs from an AC adaptor in that the DC adaptor converts AC electricity into DC electricity. For example, a 12 V DC adaptor sold in the United States will convert 120 V AC at 60 Hz into 12 V DC.

Like its AC counterpart, a DC adaptor is also rated for maximum power output in watts. Therefore, a 12 V DC adaptor rated at 36 W will also be capable of a maximum output of 3 A, but the difference is that the current is constant, flowing in one direction, rather than the constantly reversing alternating current that the AC adaptor puts out [11].

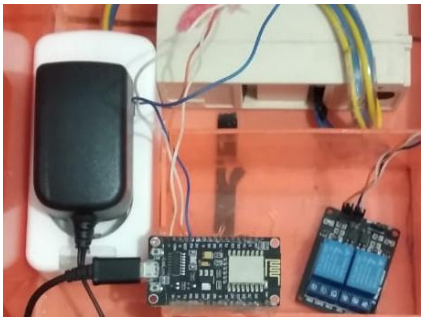

Figure 6. Adaptor smartphone

3. Research Methods

Sunlight can be used to help in automatic clothes drying, using a web system the tool will work Chen rain then the rain sensor which as a water detector then the sensor will be active and the motor can work, clothing that had been outside then the fabric will enter the room to avoid rain. Example picture of an automatic cloth clothesline device, so that the fabric does not break easily when the cloth is too long to dry because it has been in the sun for too long, and this tool is also designed so that the fabric can fit in the shade when it rains, keeping the fabric dry and odorless musty.

If a rain sensor is detected by water, the web system of the NodeMCU component will be active and give commands to the relay. Leptop is here to program the software from the relay, after the program runs the relay will be active and the motor can run forward or backward if that (yes) and if (no) then the motor cannot work forward or backward.

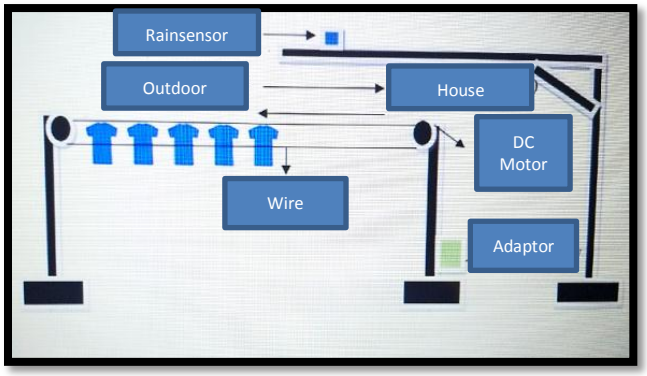

Figure 7. Automatic drying tool design

4. Result

The process of designing an automatic cloth clothesline tool began with making a design. After that I prepare the materials and tools needed to make the automatic cloth clothesline rank.
Several sizes will be made for automatic fabric drying:
1. Length of rope used 6 x 2 = 12 meters
2. The height of the mast used is 175 cm
3. The size of the pole used is 2.5 cm x 2.5 cm
4. Height of the roof used 2.2 meters

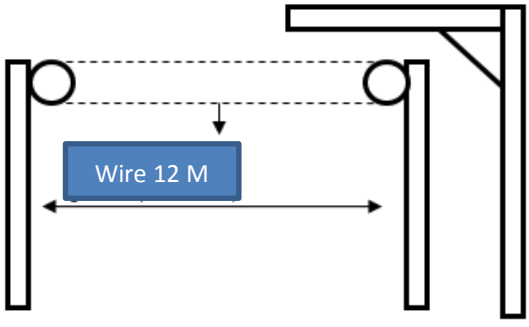

Figure 8. Clothesline design

Before installing the components that will be connected to the dc motor, this test begins with the testing of the dc motor which has been assembled with a clothesline that will be cloth-dried.

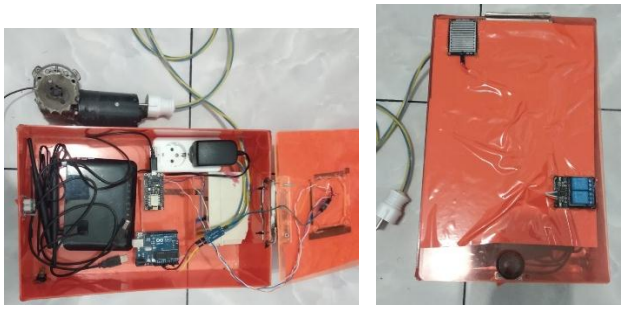

Figure 9. Design of automatic clothesline equipment.

Illustrates that the dc motor is directly connected to the power supply, when it is connected the motor will run. When the motor is running, start measuring the load of the fabric to be dried in the sun, the fabric is counted if the cloth is wet.

Figure 10. Fabric load measurement

Researchers are trying to run the motor in the presence of a wet cloth load. Different types of fabric are used. The problem that often occurs in measuring the load of fabric is the heavier cloth that is dried in the sun, the slower the speed of the running motor.

Table 1. Fabric load measurement

No.	Weight (Kg)	Fabric Type	Motor
1	5.75	Jeans	On
2	1.1	Cotton	On
3	1.6	Tissue	On

Fabric weight is measured by a scale so that it can calculate the weight of the wet cloth obtained. The maximum number of fabrics that will be used in the automatic clothesline is to keep the motor running and the motor is not easily damaged, the fabric is different in weight and type, for the weight of the fabric obtained by the researchers found in table 1 and for the number of fabrics found in table 2.

Table 2. Motor rotation measurement

No.	Total (Qty)	Fabric Type	Motor
1	5	Jeans	On
2	3	Cotton	On
3	4	Tissue	On

The fabric is dried in the sun adjusted to the type of fabric, which begins with the type of jeans fabric, the number of jeans fabric at least 5 used by researchers, when the motor is running then continued with cotton cloth, the number of cotton cloth used by researchers there are 3, if the motor walking then followed by tissue cloth, for the number of tissue cloth only a minimum of 4 tissue cloths are used only when the motor is running, the researcher tries to combine all types of fabric, the total number of cloths

is 12 cloths and the motor cannot run, because after testing the motor can only withstand a load of 7.5 kg or 10 fabrics only.

Tool testing can be done by operating all devices starting with applying voltage to the relay, then applying more voltage to NodeMCU, then the researcher tries the sensor (water). It aims to test the motor can move when it rains.

5. Conclusions

After doing the design and realization of the automatic clothesline system, testing of the device is carried out, both in the form of blocks and as a whole. Then conclusions can be drawn:

1. Devices that have been made by researchers can work well as expected.
2. The rain sensor can work in the presence of water or rain drops when it rains.
3. Web system can work when the fabric is dry and the system keeps the fabric from being damaged if it is too long in the sun.
4. Microcontroller which is used as the main controller, this tool can work in running programs or commands given.
5. The speed of the program in reading is less than 2 seconds.

6. Acknowledgments

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